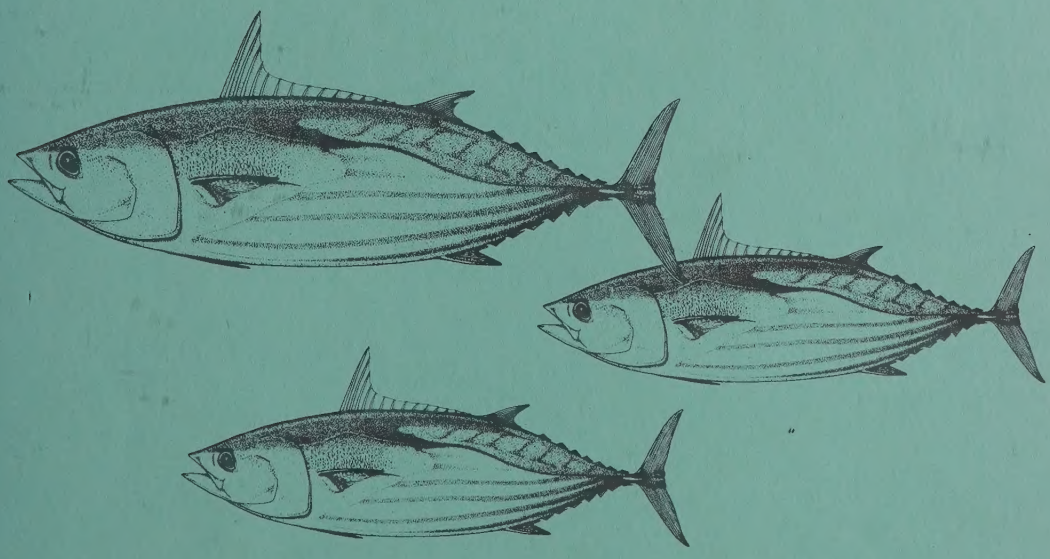
MARCH 1978
No. 3

# FISHING INFORMATION

## Southwest Fisheries Center-La Jolla, California



noaa NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION / NATIONAL MARINE FISHERIES SERVICE

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
SOUTHWEST FISHERIES CENTER
8604 LA JOLLA SHORES DRIVE - P. O. BOX 271
LA JOLLA, CALIFORNIA 92037

# FISHING INFORMATION

MARCH 1978, No. 3

EDITOR: JAMES A. RENNER

I. Barrett, Director, SOUTHWEST FISHERIES CENTER
R. Lasker, Acting Deputy Director
R. Shomura, Director, Honolulu Laboratory
N. Abramson, Director, Tiburon Laboratory
G. Seckel, Chief, Pacific Environmental Group, Monterey

# PREFACE

This publication, Fishing Information, appears monthly and contains 1) fishery advisory information, 2) a narrative description of pertinent surface temperature conditions, 3) charts of winds and pressures for the eastern North Pacific, 4) charts of sea surface temperature for the North Pacific and eastern tropical Pacific, and 5) charts of subsurface temperature structure in the eastern North Pacific.

A supplement to Fishing Information appears at 15-day intervals throughout the year. It contains a chart of sea surface temperature (contoured at 2°F (1°C) intervals) from Baja California to Vancouver Island out to about 135°W. Special bulletins are published in conjunction with the 15-day sea surface temperature charts which include short-term projections of albacore distribution and locations of productive fishing areas, information on oceanographic and atmospheric conditions, and other information as is appropriate during the albacore fishing season.

Submitted for publication - April 25, 1978

# CONTENTS


| | | Page |
|---|---|---|
| Acknowledgements | | iv |
| Sea Surface Temperature and Environmental Conditions - March 1978, Forrest R. Miller | | 1 |
| ENVIRONMENTAL CHARTS, PACIFIC OCEAN - March 1978 | | |
| Figure 1. | Eighteen-year mean (1961-1978) observed sea level values of barometric pressure (millibars), resultant wind direction (degrees true), resultant wind speed (knots) and average winds speed (knots) regardless of direction. | 4 |
| Figure 2. | Observed sea level values of barometric pressure (millibars), resultant wind direction (degrees true), resultant wind speed (knots) and average wind speed (knots) regardless of direction. | 5 |
| Figure 3. | Mean sea surface temperature, eastern North Pacific Ocean. Square shows temperatures at weathership station. Numerals on shore are temperatures at coastal and lightship stations. | 6 |
| Figure 4. | Mean sea surface temperature chart, western North Pacific Ocean. | 7 |
| Figure 5. | Deviation of sea surface temperatures, eastern North Pacific Ocean from 20-year mean (1948-67). Hatched areas are colder in 1978. | 8 |
| Figure 6. | Deviation of sea surface temperatures, western North Pacific Ocean from 20-year mean (1948-67). Hatched areas are colder in 1978. | 9 |
| Figure 7. | Deviation of sea surface temperatures, eastern North Pacific Ocean from those of March 1978. Hatched areas are colder in 1978. | 10 |
| Figure 8. | Mean sea surface temperatures, eastern tropical Pacific Ocean. | 11 |
| Figure 9. | Deviation of sea surface temperatures, eastern tropical Pacific Ocean from 20-year mean (1948-67). Shaded areas are colder in 1978. Contours are dashed in sparse data areas. | 12 |
| Figure 10. | Surface temperature and salinity and subsurface temperature structure from expendable bathythermograph observations between San Francisco and Honolulu March 16-23, 1978. | 13 |



ENVIRONMENTAL CHARTS ANALYZED BY:

F. Miller (Figures 8 and 9)
J. Renner (Figures 1, 2, 3, 4, 5, 6, 7, and 15 day Supplement)

TECHNICAL EDITOR:
R. Allen
CARTOGRAPHY:
R. Allen, H. Orr

# Acknowledgements

The following organizations and stations contributed data for March 1978 charts:

Inter-American Tropical Tuna Commission, La Jolla, California
Kelco Company, San Diego, California
National Oceanic and Atmospheric Administration
National Marine Fisheries Service, La Jolla, California; Honolulu, Hawaii
National Weather Service, San Diego, California and Washington D.C.
National Ocean Survey, Pacific Marine Center, Seattle, Washington

Fisheries Research Board of Canada, Pacific Environment Institute, West Vancouver, British Columbia by L.F. Giovando from observations by:
J. Redhead at Langara Island Light; C.T. Hilliar at Cape St. James Light;
L. Collins at Kains Island Light; M.V. Stewart at
Amphitrite Point Light

Scripps Institution of Oceanography, La Jolla, California

Expendable bathythermograph and salinity observations are made by the mates and engineers of the *Hawaiian Queen* of the Matson Navigation Co. The data are processed under supervision of D.R. McLain at the NMFS Pacific Environmental Group, Monterey, California, using computer facilities of the Fleet Numerical Weather Central, Monterey. The project is partially supported by the National Science Foundation and the Office of Naval Research.

# Sea Surface Temperature and Environmental Conditions

Forrest R. Miller

## Eastern North Pacific

During March the Aleutian low pressure center is normally less intense than during the winter months and shifts eastward over the southern part of Alaska near 150°W. The subtropical high pressure center is normally located near 30°N, 145°W (Figure 1). The westerly surface winds between the Aleutian low and the subtropical high pressure systems are usually less intense and the storms reaching the U.S. west coast south of 40°N are less frequent in March than in February. By March, the northeast trade winds increase along the east and south periphery of the subtropical high pressure system.

In March 1978 the Aleutian low center was displaced southwest of its normal position, and pressures around the center were 8 to 10 millibars below normal. The subtropical high pressure center was displaced about 10° of longitude west of its normal position (Figure 2). Frequent storm systems moved rapidly across the eastern Pacific over a wider than normal latitudinal band between 35°N and 45°N. As a result of the westward displacement of the two major low and high pressure systems, most weather fronts swept the entire U.S. west coast during March and brought somewhat colder weather to southern California coastal areas.

The sea surface temperature (SST) pattern for March (Figure 3) east of 135°W and north of 35°N, where the isotherms bulged northward along 130°W, reflected a more southerly surface circulation than normal. SST's were more than 1°C above normal along the U.S. west coast and Baja California (Figure 5). West of Baja California and south of 30°N the area covered by positive SST departures of 1°C or more expanded from February to March. A comparison of SST's in March 1978 with March 1977 (Figure 7) east of 135°W showed that the pattern was similar to that based on the long term mean (Figure 5). In March 1977 SST's along the U.S. west coast and west of Baja California had returned to near normal; but during March 1978 the high frequency of storms associated with a more southerly circulation and a displaced subtropical high center helped to maintain above normal SST's east of 130°W. The large area west of 140°W from 30°N to 45°N covered by negative SST departures greater than 1°C has persisted since December 1977, when winter storms began to move eastward from the Central Pacific along more southerly (south of 40°N) trajectories than normal. During March, storms moved across the mid-Pacific very rapidly with deep low pressure centers and strong surface winds which mixed the ocean surface layers. In March 1977 storm activity was much less than in March 1978 south of 40°N between 140°W and 160°W. Consequently, SST's have remained significantly colder than normal in that area (Figure 7). South of 25°N the presence of the subtropical high pressure system with light winds and low cloudiness west of 140°W brought about a general warming of SST's in amounts significantly greater than 1 year ago.

## Western North Pacific

During March the Aleutian low pressure system normally extends into the western Pacific between 40°N and 50°N. Storms develop south of the Aleutian low east of Japan and moved rapidly eastward between 30°N and 40°N, leaving deeply mixed ocean surface layers in the wake of heavy winds and cloud cover along the weather fronts. The subtropical high pressure system normally extends across the entire western Pacific along 30°N.

In March 1978 the Aleutian low pressure system consisted of two centers. The western most low pressure center was near 47°N, 160°E with central pressures 6 to 8 millibars below normal. South of the low pressure center, storms developed frequently and moved eastward between 35°N and 40°N. Strong winds around the storm centers caused deep mixing of ocean surface layers, resulting in SST's more than 1°C below normal over a large area from 35°N to 45°N and east of 165°E (Figure 6). Along 40°N, in this area, the north Pacific ocean front appeared to be more pronounced than usual as indicated by the strong SST gradients shown in Figure 4. East of Japan and north of 35°N the tight packing of SST contours were associated with deviations 1°C or more

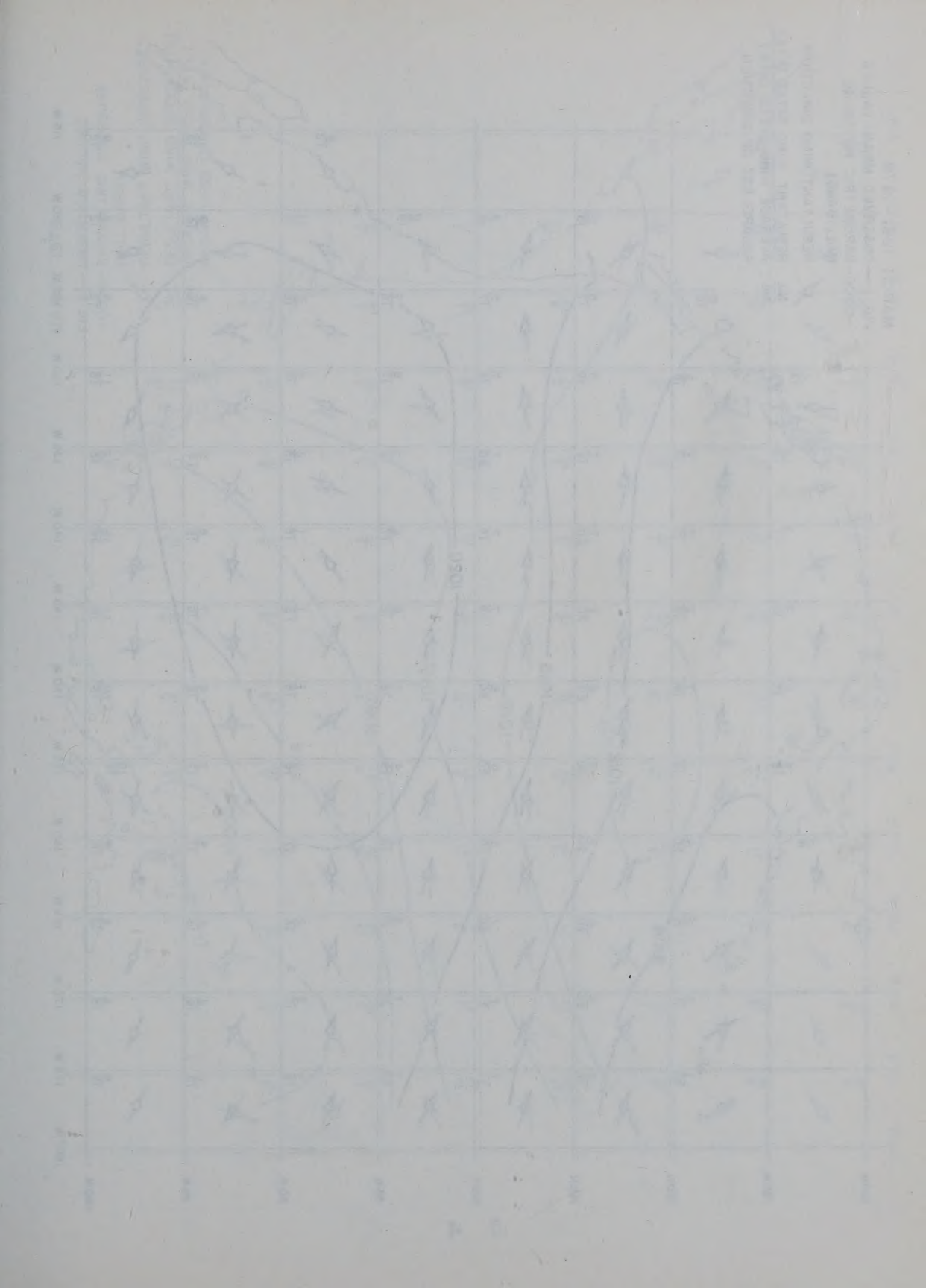
below normal along the east coast of Japan, and a large area of more than 1°C above normal east of 150°E. Changes in the ocean-atmosphere circulation from February through March reflected a shift from warm to cold water along the coast of Japan. From 25°N to 30°N, SST's were more than 1°C below normal (Figure 6) which may have been associated with the southwest extension of weather fronts and above normal wind mixing in the surface layers of the ocean. These conditions were similar to the ocean weather patterns that prevailed in February 1978.

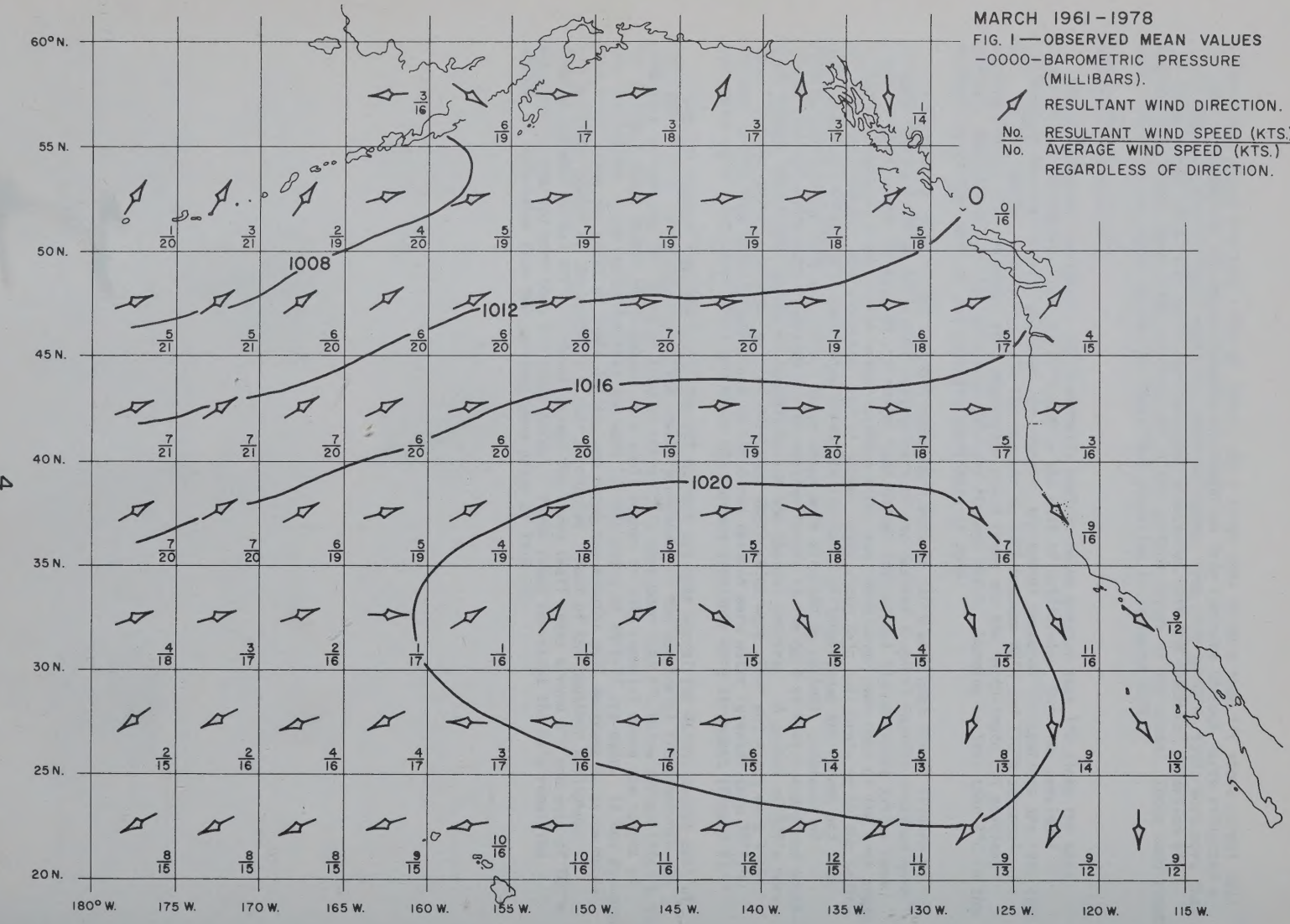
Eastern Tropical Pacific

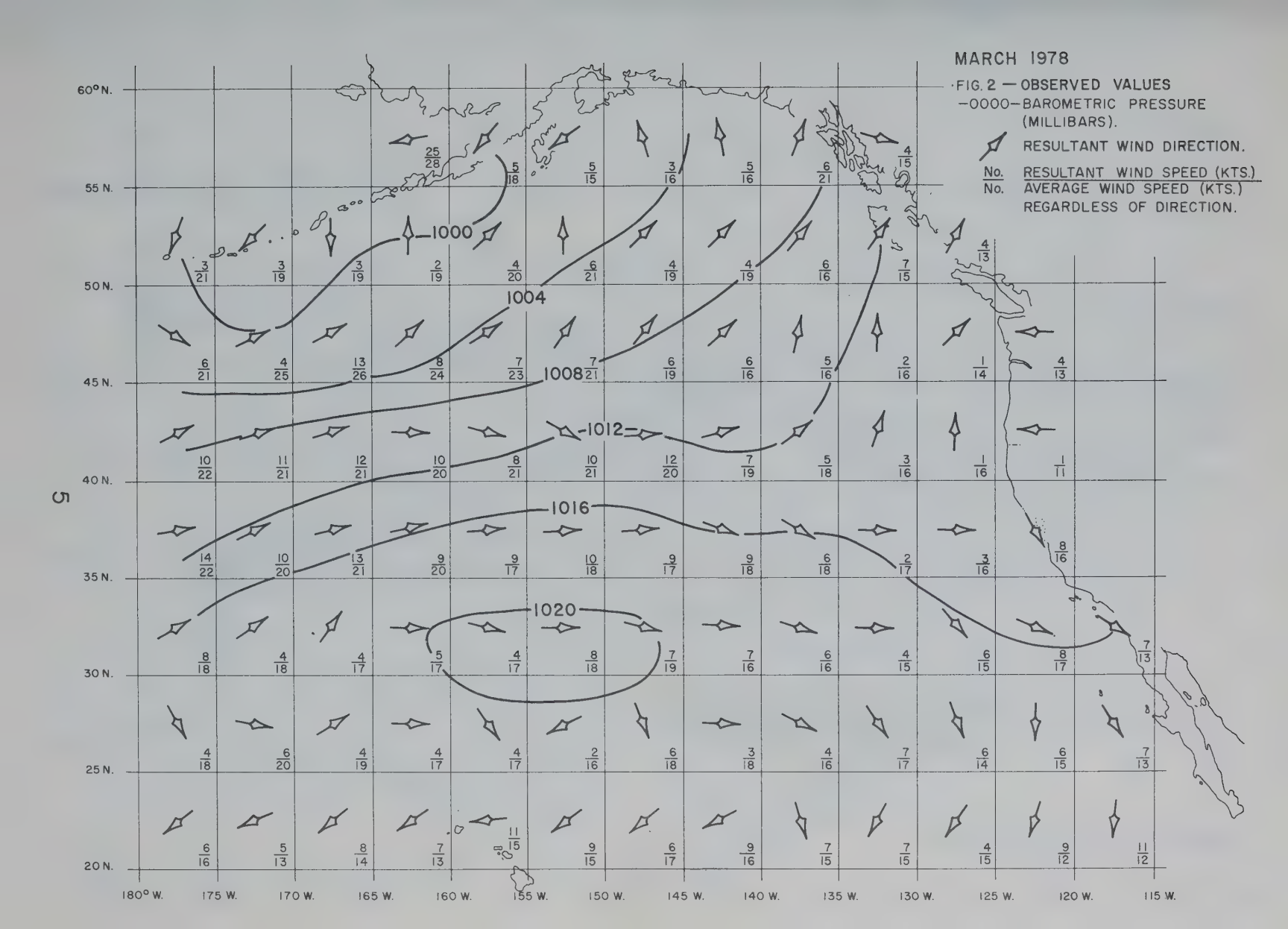
In the northern hemisphere, SST's normally cool at rates greater than 1°C along the west coast of Baja California south of 25°N and in the Gulf of California. Over the remainder of the eastern tropical Pacific north of the equator, the normal seasonal fluctuations are less than 1°C. In the southern hemisphere from the equator to 10°S between 85°W and 110°W seasonal warming exceeds 1°C. However, this equatorial ocean front and the north-south SST gradient normally remains weak in this area from February through March. Warming is less than 1°C in the surface layers over most of the southern hemisphere to 30°S.

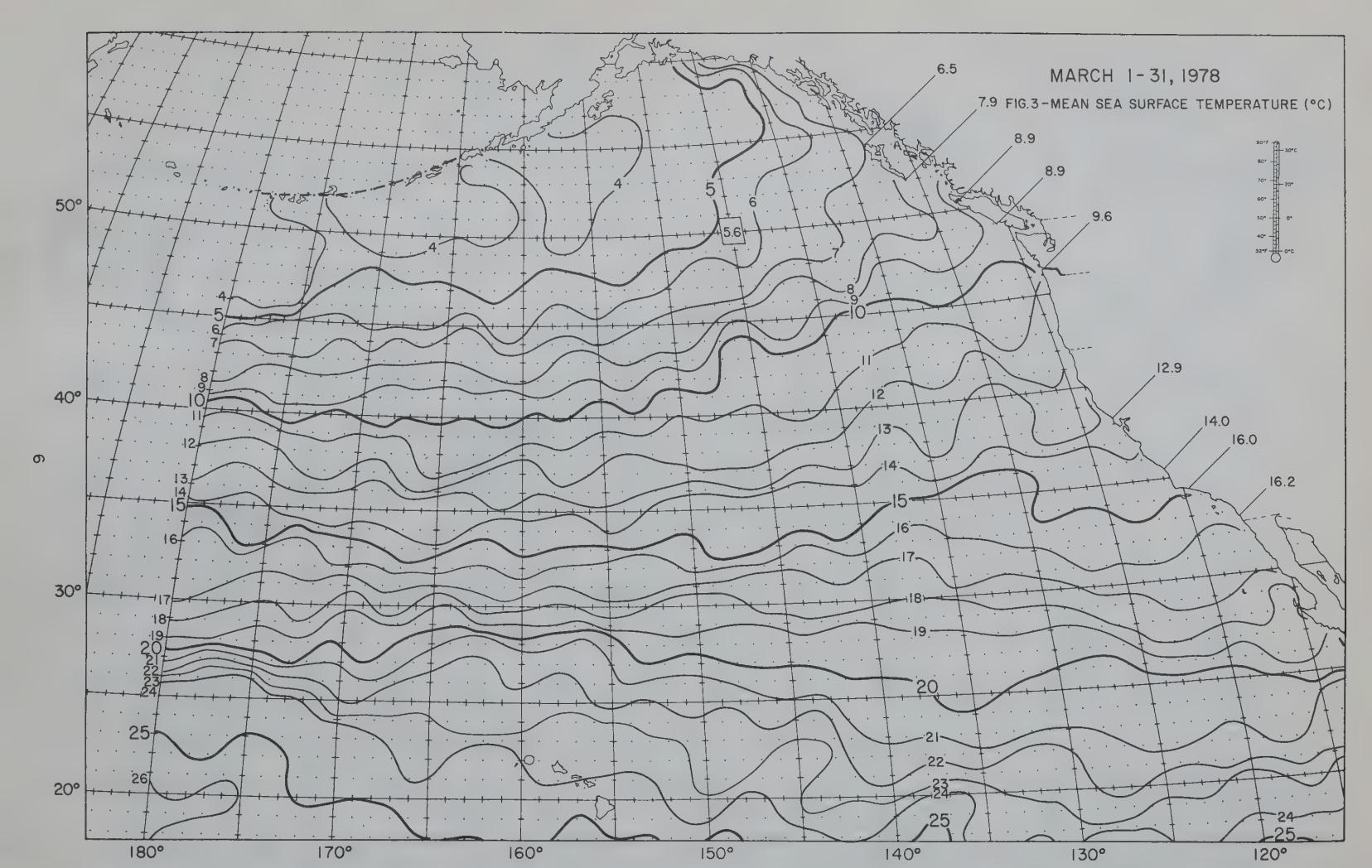
In March 1978 SST's in the northern hemisphere west of 145°W were near normal (Figure 8). Between 145°W and 105°W, SST's over a large part of the eastern tropical Pacific remained more than 1°C above normal (Figure 9). A weaker than normal subtropical high pressure system east of 140°W (Figure 2) caused below normal surface winds and cloud cover over most of the area south of 20°N. As a result, SST's did not cool at normal rates along Baja California or to the southwest. East of 110°W, SST's were below normal in the Gulfs of Tehuantepec and Panama and from 10°N to 15°N between 90°W and 110°W. These areas were affected by periodic outbreaks of northerly winds which were generated behind weather fronts in the Gulf of Mexico and moved southward through the mountain passes of southern Mexico and Central America. A pocket of SST's more than 1°C above normal persisted west of Nicaragua where skies were clear and winds were light. The most active tuna fishing took place in the zones between warm water (greater than 28°C) and cooler water (less than 26°C) and where SST surface gradients were strongest (Figure 8).

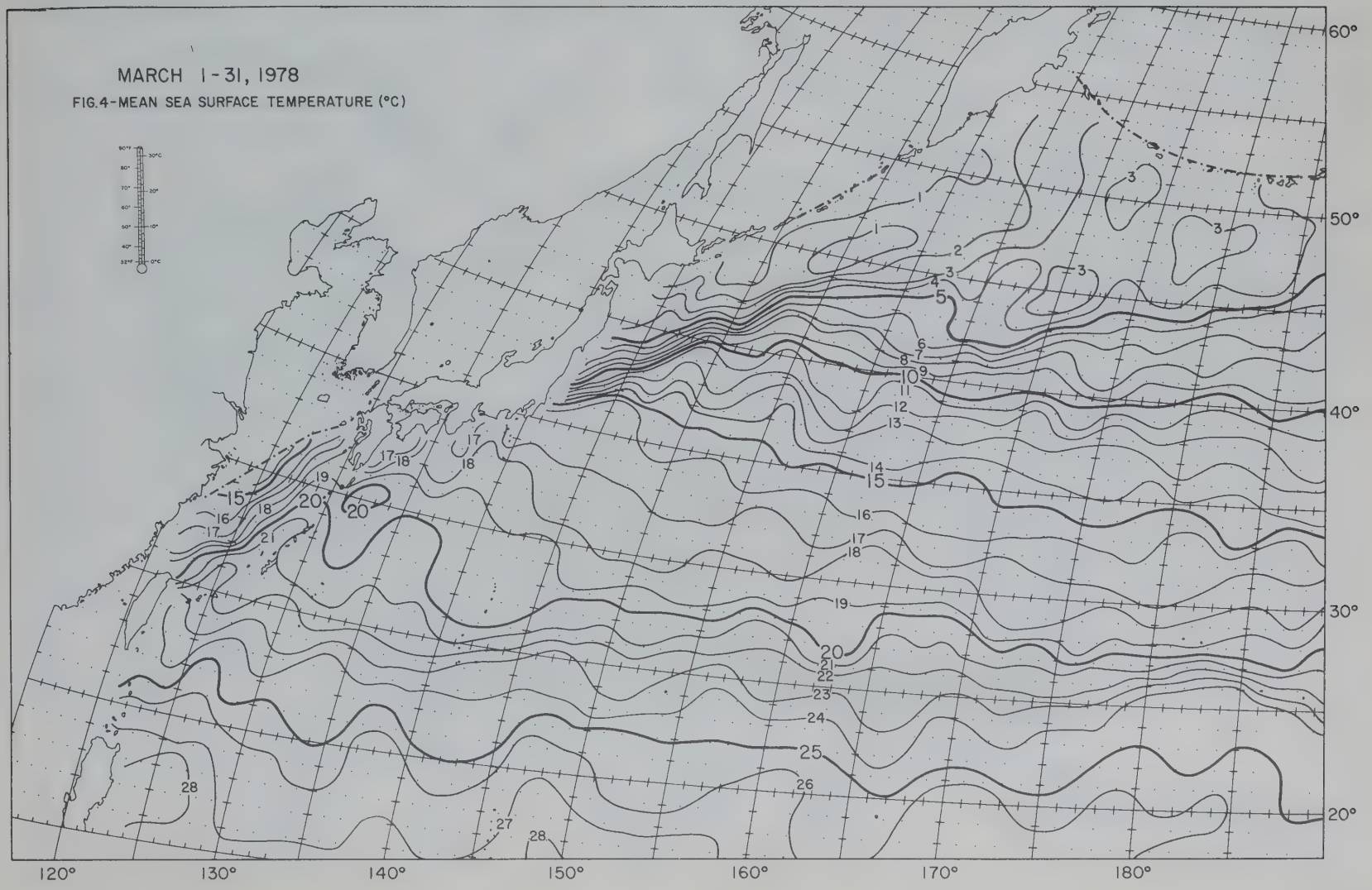
Along the equator from 5°N to 5°S the SST pattern was near normal for March, except east of 90°W and south of the equator along the southern boundary of the equatorial front between the Galápagos Islands and the coast of Ecuador where SST's were more than 2°C below normal (Figure 9). The apparent below-normal SST's (based on a small number of ship reports) along the coasts of Peru and Ecuador is an indication that the warm El Niño years of 1976-77 are over. It now appears that SST's along the coast of South America and along the equator will decrease to below normal over a larger region as the southern winter approaches. Most of the southern hemisphere experienced near normal SST's in March except for three small areas around 5°S and west of 100°W where SST's remained more than 1°C above normal. These areas represent the only remaining pockets of warm water from the previous warm years of 1976-77.

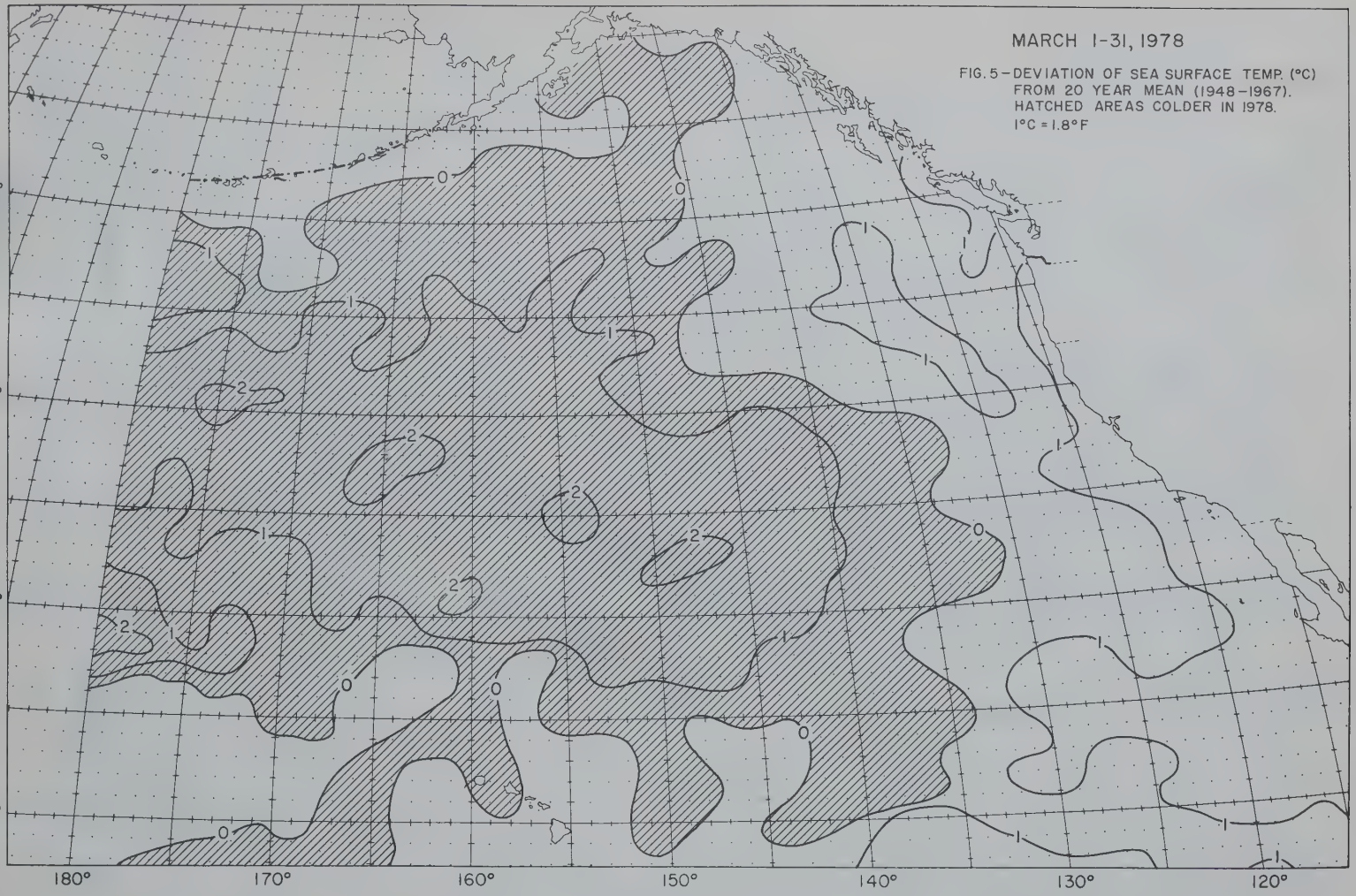


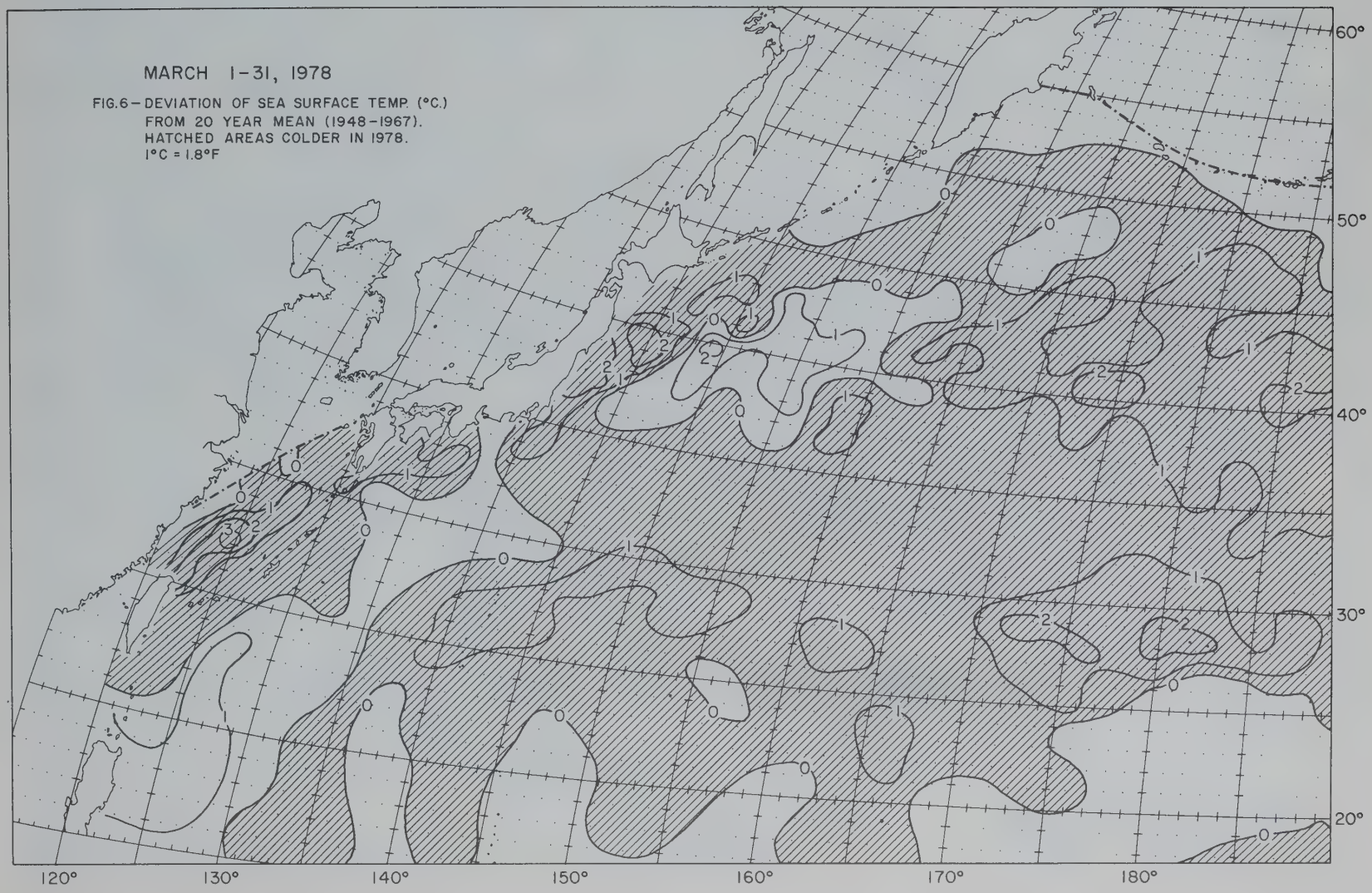

MARCH 1961-1978
FIG. 1—OBSERVED MEAN VALUES
—0000—BAROMETRIC PRESSURE (MILLIBARS).
RESULTANT WIND DIRECTION.
No. RESULTANT WIND SPEED (KTS.)
No. AVERAGE WIND SPEED (KTS.) REGARDLESS OF DIRECTION.
1008
1012
1016
1020
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.

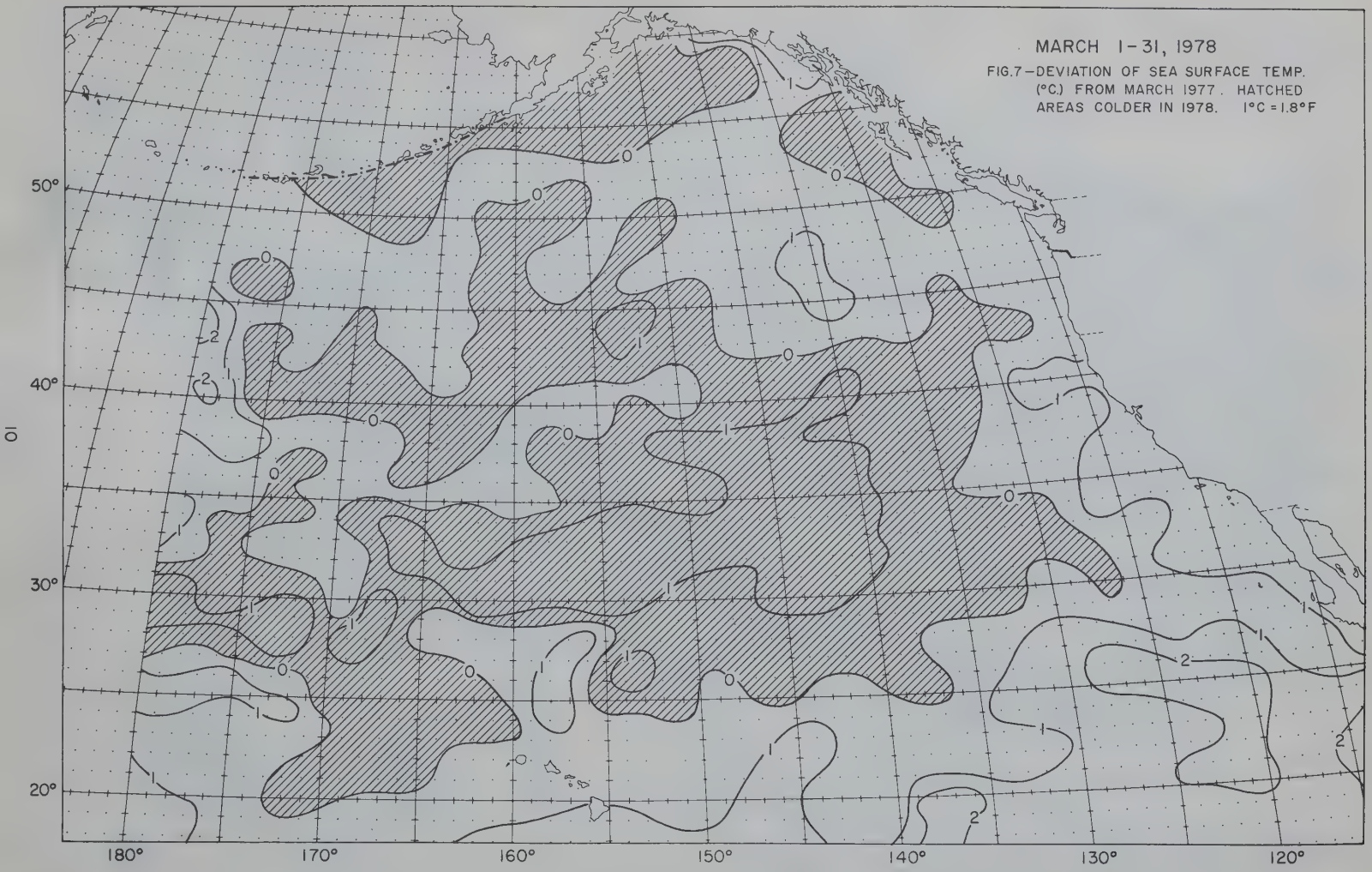

MARCH 1978
FIG. 2 — OBSERVED VALUES
—0000— BAROMETRIC PRESSURE (MILLIBARS).
RESULTANT WIND DIRECTION.
No. / No. RESULTANT WIND SPEED (KTS.) / AVERAGE WIND SPEED (KTS.) REGARDLESS OF DIRECTION.
1000
1004
1008
1012
1016
1020
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.

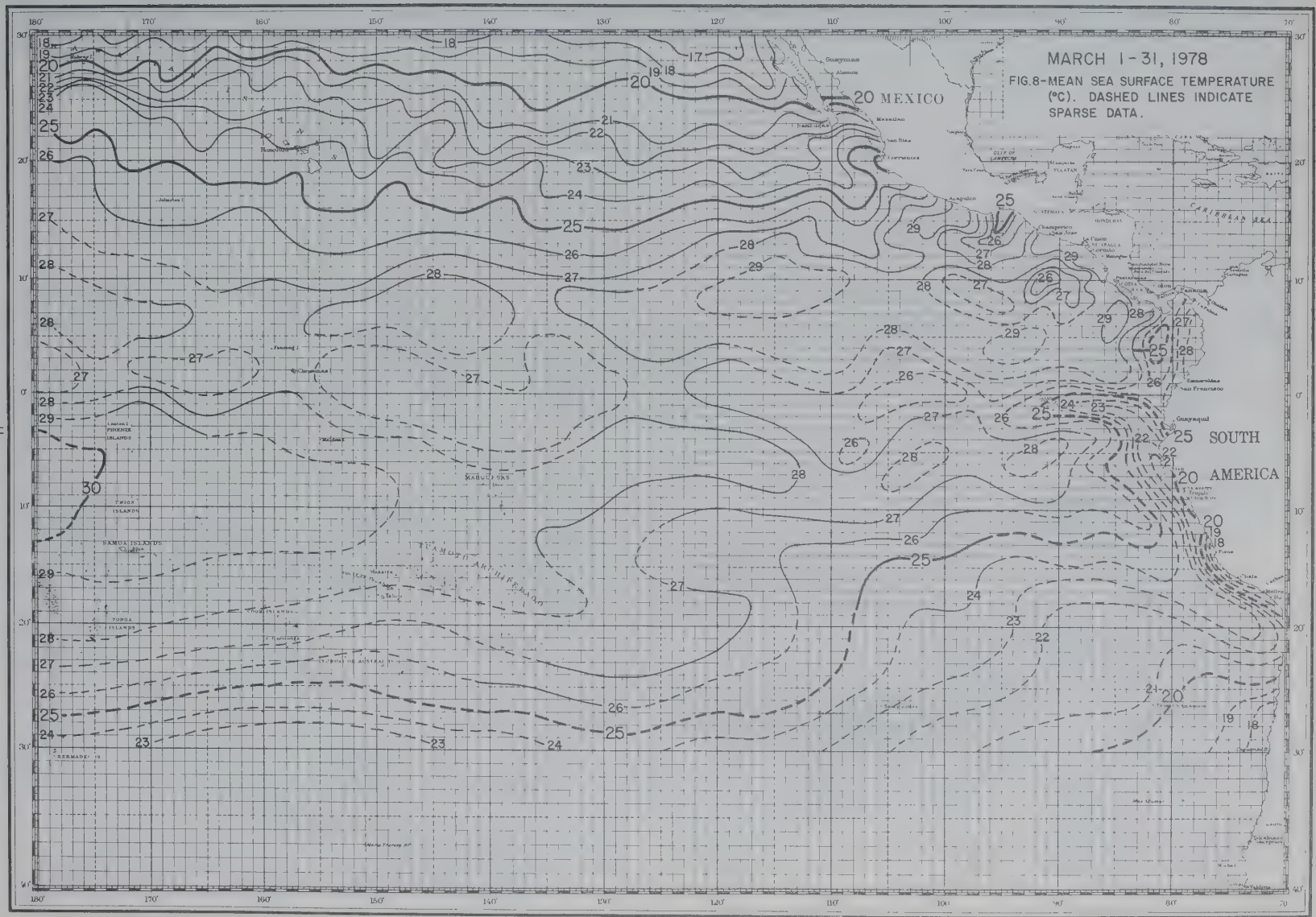

MARCH 1-31, 1978
FIG.3-MEAN SEA SURFACE TEMPERATURE (°C)
6.5
7.9
8.9
8.9
9.6
12.9
14.0
16.0
16.2
5.6
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°


MARCH 1-31, 1978
FIG.4-MEAN SEA SURFACE TEMPERATURE (°C)
60°
50°
40°
30°
20°
120°
130°
140°
150°
160°
170°
180°


MARCH 1-31, 1978
FIG. 5 – DEVIATION OF SEA SURFACE TEMP. (°C) FROM 20 YEAR MEAN (1948–1967). HATCHED AREAS COLDER IN 1978.
1°C = 1.8°F
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°


MARCH 1-31, 1978
FIG.6- DEVIATION OF SEA SURFACE TEMP. (°C.)
FROM 20 YEAR MEAN (1948-1967).
HATCHED AREAS COLDER IN 1978.
1°C = 1.8°F
60°
50°
40°
30°
20°
120°
130°
140°
150°
160°
170°
180°


MARCH 1-31, 1978
FIG.7—DEVIATION OF SEA SURFACE TEMP. (°C.) FROM MARCH 1977. HATCHED AREAS COLDER IN 1978. 1°C = 1.8°F
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°


MARCH 1-31, 1978
FIG.8-MEAN SEA SURFACE TEMPERATURE (°C). DASHED LINES INDICATE SPARSE DATA.
MEXICO
SOUTH AMERICA
CARIBBEAN SEA
GULF OF CAMPECHE
Guayaquil
Acapulco
Manzanillo
Champerico
PHOENIX ISLANDS
SAMOA ISLANDS
TONGA ISLANDS
MARQUESAS
ALEUTIAN ARCHIPELAGO
TROPIC OF CANCER
EQUATOR
TROPIC OF CAPRICORN
180°
170°
160°
150°
140°
130°
120°
110°
100°
90°
80°
70°
30°
20°
10°
0°
10°
20°
30°
40°

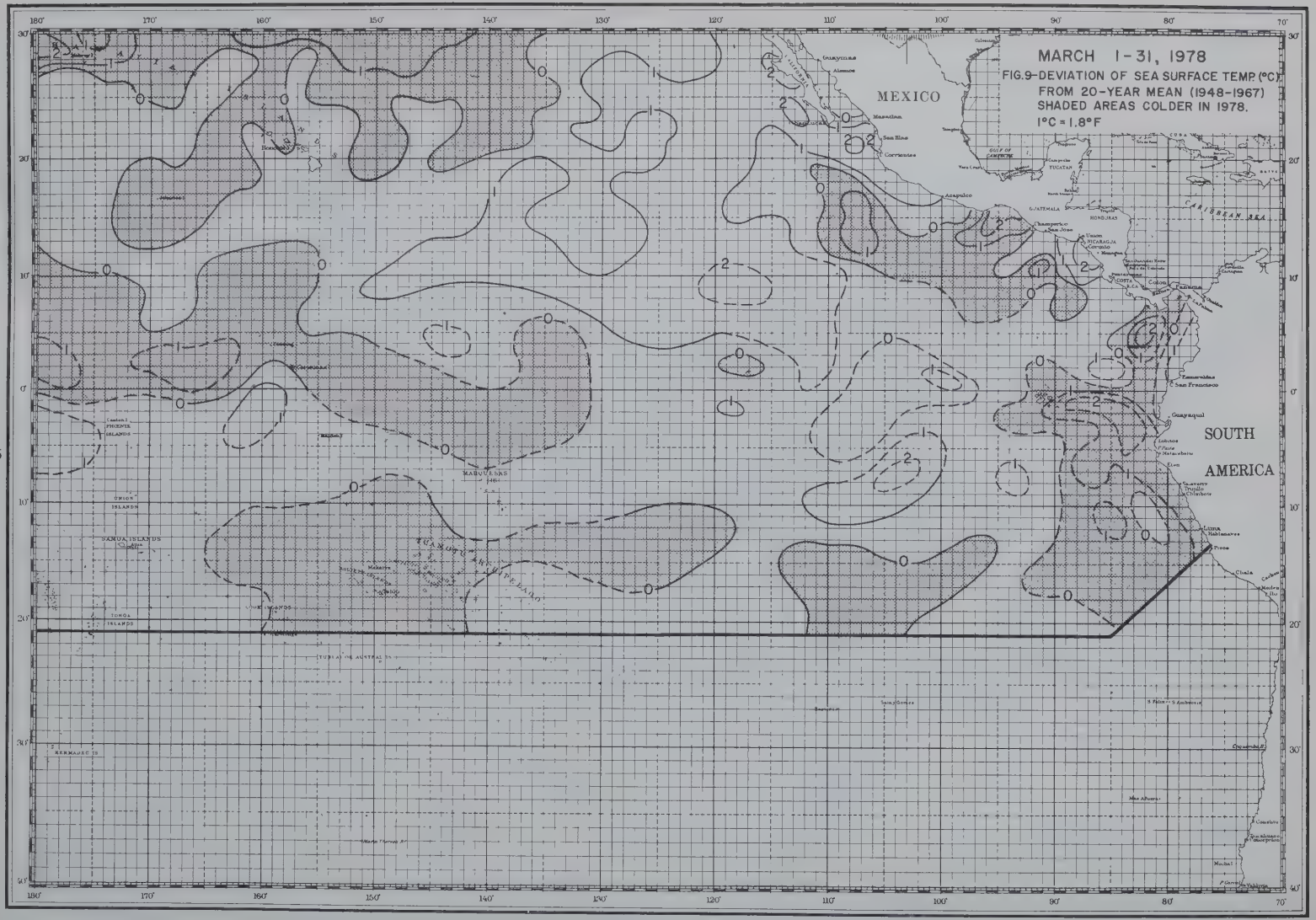
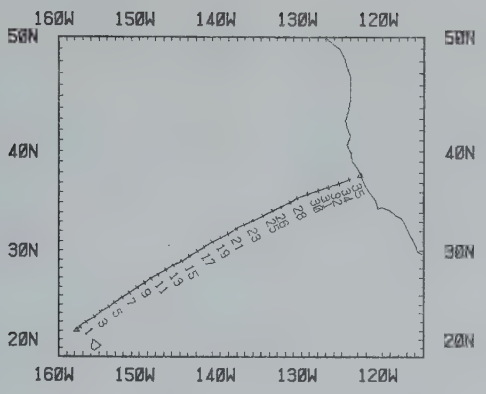
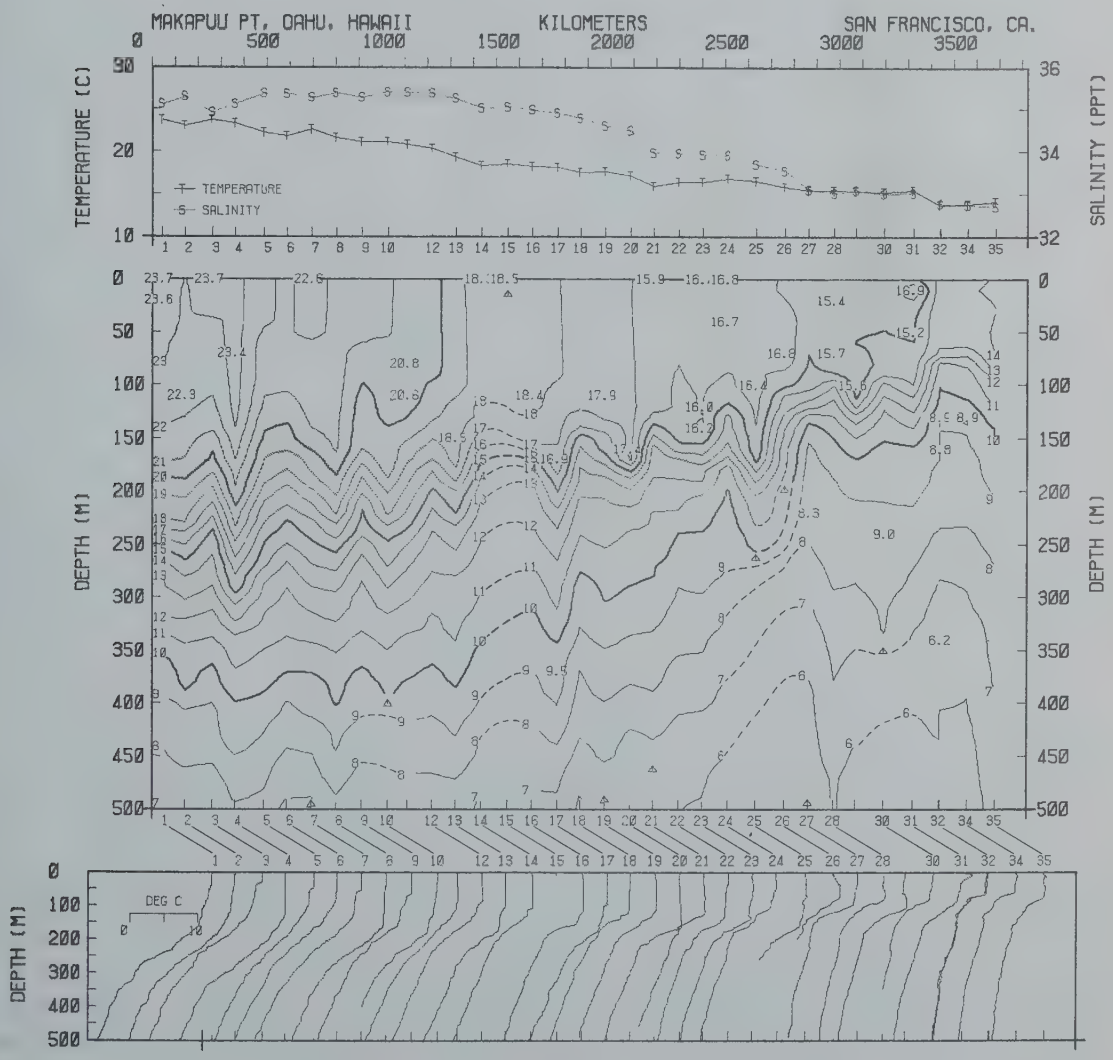

MARCH 1-31, 1978
FIG.9-DEVIATION OF SEA SURFACE TEMP.(°C) FROM 20-YEAR MEAN (1948-1967) SHADED AREAS COLDER IN 1978.
1°C = 1.8°F
MEXICO
SOUTH AMERICA
CARIBBEAN SEA
GUATEMALA
HONDURAS
NICARAGUA
COSTA RICA
PANAMA
CUBA
GULF OF MEXICO
YUCATAN
Acapulco
Manzanillo
San Blas
Corrientes
Champerico
San Jose
Corinto
Balboa
Colon
Panama
Esmeraldas
San Francisco
Guayaquil
Lobitos
Talara
Malabrigo
Chimbote
Huacho
Callao
Pisco
Chala
Matarani
Arica
Iquique
Antofagasta
Valparaiso
Coquimbo
Mazatlan
Guaymas
Alamos
Topolobampo
Cabo San Lucas
Ensenada
Socorro
Clarion
Revillagigedo Is.
Cocos Is.
Galapagos Is.
Malpelo Is.
Gorgona
Gorgonilla
Tumaco
Buenaventura
Malaspina
Galapagos Fracture Zone
Mendocino Fracture Zone
Murray Fracture Zone
Molokai Fracture Zone
Clarion Fracture Zone
Clipperton Fracture Zone
Marquesas Fracture Zone
Easter Fracture Zone
Chile Rise
Nazca Ridge
Carnegie Ridge
Cocos Ridge
Sala y Gomez
Easter Is.
Juan Fernandez Is.
Desventuradas Is.
Marquesas Is.
Tuamotu Archipelago
Society Is.
Tuamotu Is.
Austral Is.
Tubuai Is.
Cook Is.
Samoa Islands
Union Islands
Phoenix Islands
Tonga Islands
Kermadec Is.
Norfolk Ridge
Tasman Sea
Coral Sea
Solomon Islands
Caroline Islands
Marshall Islands
Gilbert Islands
Line Islands
Christmas Is.
Fanning Is.
Howland Is.
Baker Is.
Jarvis Is.
Palmyra Is.
Kingman Reef
Johnston Is.
Wake Is.
Midway Is.
Hawaiian Islands
Honolulu
Mariana Islands
Guam
Bonin Islands
Volcano Islands
Ryukyu Islands
Taiwan
Luzon
Mindanao
Celebes
Halmahera
Timor
Java
Sumatra
Borneo
New Guinea
New Britain
New Ireland
Solomon Is.
New Caledonia
Loyalty Is.
New Hebrides
Fiji Is.
Tonga Is.
Kermadec Is.
Norfolk Is.
Lord Howe Is.
Macquarie Is.
Auckland Is.
Campbell Is.
Antipodes Is.
Bounty Is.
Chatham Is.
Kermadec Is.
Tasmania
Australia
New Zealand
Bermuda Is.
Azores
Canary Is.
Cape Verde Is.
Madeira
Gibraltar
Malta
Crete
Cyprus
Rhodes
Sicily
Sardinia
Corsica
Balearic Is.
Portugal
Spain
France
Italy
Greece
Turkey
Algeria
Tunisia
Libya
Egypt
Israel
Lebanon
Syria
Iraq
Iran
Saudi Arabia
Yemen
Oman
Pakistan
India
Sri Lanka
Burma
Thailand
Malaya
Singapore
Indonesia
Philippines
Japan
Korea
China
Taiwan
Hong Kong
Macao
Vietnam
Cambodia
Laos
Thailand
Malaya
Singapore
Indonesia
Philippines
Japan
Korea
China
Taiwan
Hong Kong
Macao
Vietnam
Cambodia
Laos

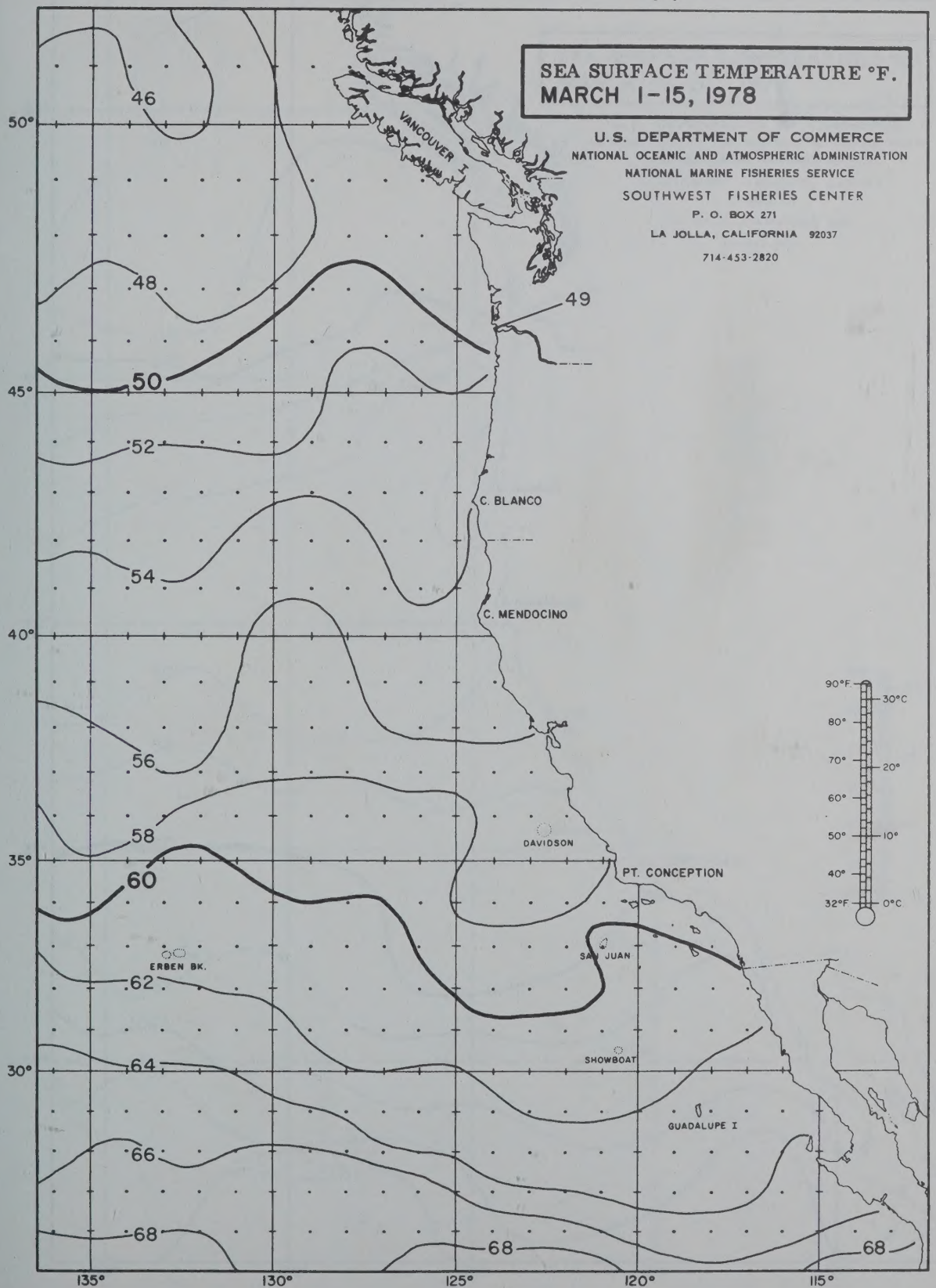
FIGURE 10

SHIP HAWAIIAN QUEEN
VOYAGE 221
MATSON
MAKAPUU PT, OAHU, HAWAII
- SAN FRANCISCO, CA.
16 MAR 1978 - 23 MAR 1978
NOAA-NMFS PEG MONTEREY, CA.



# FISHING INFORMATION – supplement



# FISHING INFORMATION – supplement